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**ABSTRACT**

A recent innovation in the area of educational measurement is MDT multi-digit testing, a machine-scored near-equivalent to "fill-in-the-blank" testing. The MDT method is based on long lists (or "Answer Banks") that contain up to 1,000 discrete answers, each with a three-digit label. Students taking an MDT multi-digit test mark the appropriate three-digit response on special answer sheets for machine scoring. As expected, attitudes about MDT multi-digit testing vary significantly among students at Illinois State University who participated in its pioneer usage. Data from questionnaires given in one semester to 1,440 students show that 41% had unfavorable attitudes toward the testing method, while the remainder were neutral (36%) or had favorable perceptions (23%). This paper examines 10 variables to determine which relate to favorable and unfavorable attitudes about the MDT multi-digit technique. Apart from instructor-related factors, the variables related to favorable attitudes toward MDT testing include greater familiarity/experience with the method and higher academic performance. Five figures are presented, and an appendix contains the survey used (the Survey of Student Opinions about Methods of Educational Testing).  
(Author/SLD)

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# Student Attitudes about MDT Multi-Digit Testing:

## Analyses from Pioneer Experiences

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### ABSTRACT

A recent innovation in the area of educational measurement is MDT multi-digit testing, a machined-scored near-equivalent to "fill-in-the-blank" testing. The MDT method is based on long lists (or "Answer Banks") which contain up to 1,000 discrete answers, each with a three-digit label. Students taking an MDT multi-digit test mark the appropriate three-digit response on special answer sheets for machine scoring. As expected, attitudes about MDT multi-digit testing vary significantly among students who participated in its pioneer usage. Data from questionnaires given in one semester to 1440 students show that 41 percent had unfavorable attitudes toward the testing method, while the remainder were neutral (36 percent) or had favorable perceptions (23 percent). This paper examines ten variables to determine which relate to favorable and unfavorable attitudes about the MDT multi-digit technique. Apart from instructor-related factors, the variables related to favorable attitudes toward MDT testing include greater familiarity/experience with the method and higher academic performance.

[Paper presented at the annual conference of the National Council for Measurement in Education, Washington, D.C., on April 19-23, 1987.]

## Introduction

Student attitudes about the MDT multi-digit testing method have been quite varied. Quantitative analyses previously conducted provided only simple tallies showing that approximately half the students considered the MDT method to be as acceptable or better than other testing methods. The other half disliked the multi-digit method; numerous students paid back-handed compliments like "it requires me to study too much." The objective of the exploratory research reported in this paper is to identify student attributes that relate to student attitudes about the MDT testing method. This paper 1) explains the MDT technique, 2) describes the sample and data collection procedures, 3) analyzes the variables and 4) draws conclusions about students attitudes toward MDT testing.

## The MDT Technique

The MDT multi-digit testing method is essentially a machine-scored "fill-in-the-blank" test. Technically, the MDT technique is all of the following: machine-scored, clued free-response, discrete answer, multiple-digit, and long-list answer bank educational testing, with distinctive computer assisted processing and feedback.

The stems of the questions are prepared in a normal manner. For example: "Name the second president of the United States." Students who know the answer look at a provided alphabetized long-list to obtain the associated label number. The label number is then marked on a machine-readable answer sheet →

(see attached Figure 1). Students who do not know the answer are generally unable to select the correct label because the list (or "answer bank") with up to 1,000 discrete alternatives is intentionally too long to allow searching for unknown answers. Those who know the answer (John Adams in this example) will easily find the code number. Much more thorough descriptions including a substantial bibliography and discussions are in the book entitled, The MDT Innovation: Machine Scoring of Fill-in-the-Blank Tests (Anderson 1987). The multi-digit testing technique has been used since 1983 with over six thousand student enrollments at Illinois State University. The MDT method is applicable to all fields of study at all educational levels from upper elementary through graduate school, including training programs and competency testing. Physicians are expected to **KNOW** certain facts about anatomy and medicine, while seventh grade students are expected to **KNOW** facts appropriate to their grade level. Instructors retain complete control of the content covered and the question difficulty.

The MDT testing technique is not a research instrument in this study. Rather, it provides the "treatment" about which the students express their attitudes.

### **Data Collection Methods**

Student evaluations and opinions of the MDT method were collected near the conclusion of the Fall 1986 semester. The investigator and all of the other fourteen pioneer instructors that semester at Illinois State University used the same

Figure 1

### MDT LIST for U.S. HISTORY PEOPLE

<b>A</b>	101 Adams, Abigail	214 Hudson, John
	102 Adams, John	215 Hutchins, John
	103 Adams, John Quincy	216 Jackson, Andrew
	104 Adams, Samuel	217 Jackson, Andrew
	105 Allen, Ethan	218 Jackson, Andrew
	106 Anthony, Susan B.	(Stonewall)
	107 Arnold, Benedict	219 Jay, John
	108 Arthur, Chester	220 Jefferson, Thomas
	109 Axtell, John Jacob	221 Johnson, Andrew
	110 Attucks, Crispus	222 Johnson, Samuel
	111 Austin, Moses	223 Johnson, Louis
	112 Austin, Stephen F.	224 Johnson, John
<b>B</b>	113 Bacon, Nathaniel	225 Johnson, John
	114 Balboa, Vasco Nunez de	226 Ketchikan, John
	115 Baltimore, Lord	227 L'Enfant, Pierre
	(Sir George Calvert)	228 LaSalle, Sieur de
	116 Bannister, Benjamin	229 Lafayette, Marquis de
	117 Bernard, Henry	230 Lee, Richard M.
	118 Barnett, Ida Wells	231 Lee, Robert E.
	119 Barton, Clara	232 Lewis, Meriweth
	120 Beckwith, James	233 Lincoln, Abraham
	121 Bell, Alexander Graham	234 Lloyd, Henry Dea
	122 Bennett, Anthony	235 Locke, John
	123 Benton, Thomas Hart	236 Lovejoy, Elijah
	124 Biddle, Nicholas	237 Lundy, Benjamin
	125 Bingham, George Calab	238 Madison, James
	126 Birney, James G.	239 Magellan, Ferdinand
	127 Blackwell, Elizabeth	240 Mann, Boreas
	128 Boone, Daniel	
	129 Booth, John	
	130 Bowie, David	
	131 Breckinridge, James	
	132 Brown, John	
	133 Bruce, John	
	134 Bryan, James	
	135 Buchanan, James	
	136 Burke, John	
	137 Burr, Aaron	
<b>C</b>	138 Cadot, John	
	139 Calhoun, John	
	140 Cartier, Jacques	
	141 Case, John	
	142 Champlin, John	
	143 Chase, John	
	144 Chief, John	
	145 Clark, John	
	146 Clark, John	
	147 Clay, John	
	148 Cleveland, John	
	149 Clinton, John	
	150 Colum, John	
	151 Cooper, John	
	152 Corwin, John	
	153 Cortes, John	
	154 Crandall, John	
	155 Crocker, John	
	156 Crows, John	
	157 Cuffe, John	
<b>D</b>	158 DeGama, John	
	159 Davis, John	
	160 Davis, John	
	161 De Las, John	
	162 DeGlas, John	
	163 DeKalb, John	
	164 DeLeon, John	

### MDT<sup>®</sup> Multi-Digit Test Answer Sheet

1	2	3	4	5
102	000	000	000	000
000	111	111	111	111
000	222	222	222	222
000	333	333	333	333
000	444	444	444	444
000	555	555	555	555
000	666	666	666	666
000	777	777	777	777
000	888	888	888	888
000	999	999	999	999

### Sample Questions (Miscellaneous topics)

**\*\* Questions 1-3 have word answers. Encode the label numbers from the MDT Answer Bank for U.S. History.**

- The second president of the USA was (blank).
- Name the explorer who crossed the Louisiana Purchase with Clark.
- (Analogy) U.S. Grant: Union Army as (blank): Confederate Army.

**\*\* Questions 4-6 have precise numeric answers. If you think the number is 43, then mark 043 on your answer sheet.**

- What is the atomic weight of a molecule of H<sub>2</sub>O?
- Solve this equation: X = 22 + 8 (7 + 3).
- If a population is growing at a rate of two percent per annum, how many years will it take for that population to double?

Figure 1: Examples of MDT Multi-Digit Testing materials, including questions, "Answer bank" list and MDT answer sheet.

questionnaire, (copy attached in Appendix A). A wide variety of courses [and class sizes] was represented: Earth Science [47], Weather [64], Map Reading [38], Latin America [62], Africa [21], Research Methods [21], Trigonometry [71], Structure of the Number System [194], Introduction to Marketing [90], Art Appreciation [423], Introduction to Film Art [186], Military Science [57], Marriage and the Family [56], Introduction to Criminal Justice Sciences [75], and Community Based Corrections [34]. Some classes answered the survey at the conclusion of their final examination, although that was a rather biased time. Although allowed to remain anonymous, most students encoded their names and/or ID numbers. The surveys were not analyzed until after final grades were completed.

The sample of 1440 students was approximately eight-five percent of all students completing the courses that utilized the MDT testing method in that semester. However, the instructors and classes were not a random sample of all university courses. Therefore, the results cannot be applied to student bodies with different attributes. The varieties of class sizes, subject matter and instructors imposed some limitations on the research methodology. Especially noteworthy is the fact that the instructors were free to specify and modify their testing procedures as they desired, even in response to student feedback during the semester. In this regard, although a diversity of methods (e.g., number of tests) can be observed, the controls for comparisons between classes were not pre-determined nor randomly assigned. These are viewed as methodological limitations of this ex-

ploratory research. To wait for more controlled situations would have meant several semesters of delay. On a more positive side, all students within a given class had uniform treatment. Those classes included two with over 200 enrollees.

### Dependent Variable

The dependent variable was "student attitudes toward multiple digit testing." Five semantic differential questions were used to gain a composite measurement value:

52. "In general, what is your attitude about [the MDT multi-digit] method of testing? 1. strongly dislike; 2. dislike; 3. neutral; 4. like; 5. strongly like.
56. Would you recommend the continued use of the MDT testing method in this course? 1. strongly "no"; 2. basically "no"; 3. neutral; 4. basically "yes"; 5. strongly "yes".
57. Would you recommend the use of the MDT method for any other courses? 1. strongly "no"; 2. basically "no"; 3. neutral; 4. basically "yes"; 5. strongly "yes".
58. Do you consider the MDT method to be a valid or invalid way of testing when applied to the learning of discrete facts? 1. highly invalid; 2. moderately invalid; 3. neutral; 4. moderately valid; 5. highly valid.

59. If given the option to enroll in either of two sections of another course, knowing that one would use the MDT method and the other would not, what would be your choice? 1. Definitely avoid the MDT method, even if you had to adversely adjust your schedule of other classes; 2. Try to avoid the MDT method if class schedule permits; 3. Neutral, it makes no difference; 4. Try to enroll in the MDT section if class schedule permits; 5. Definitely enroll in the MDT section even if you had to adversely adjust your schedule of other classes.

The student response frequencies to each of the five questions were examined separately. A reasonable spread of responses was noted in all five cases (See Figure 2). The distributions of Items 56 and 57 (would recommend MDT for this course and for other courses, respectively) were notably similar. Although technically ordinal-level data, the assumption of an interval scale was made for purposes of data analyses. Correlation coefficients (Pearson's  $r$ ) were calculated (see Figure 3). The range was from 0.5358 to 0.7380. The latter coefficient was for Items 56 and 57, indicating that those two variables were similar but not merely identical measures.

A composite dependent variable called ATT (Attitude) was formulated by summing for each student the response codes (1 through 5) for all five dependent questions. The sum was divided by the number of dependent variable questions that each student answered. This generated a mean attitude about MDT testing for



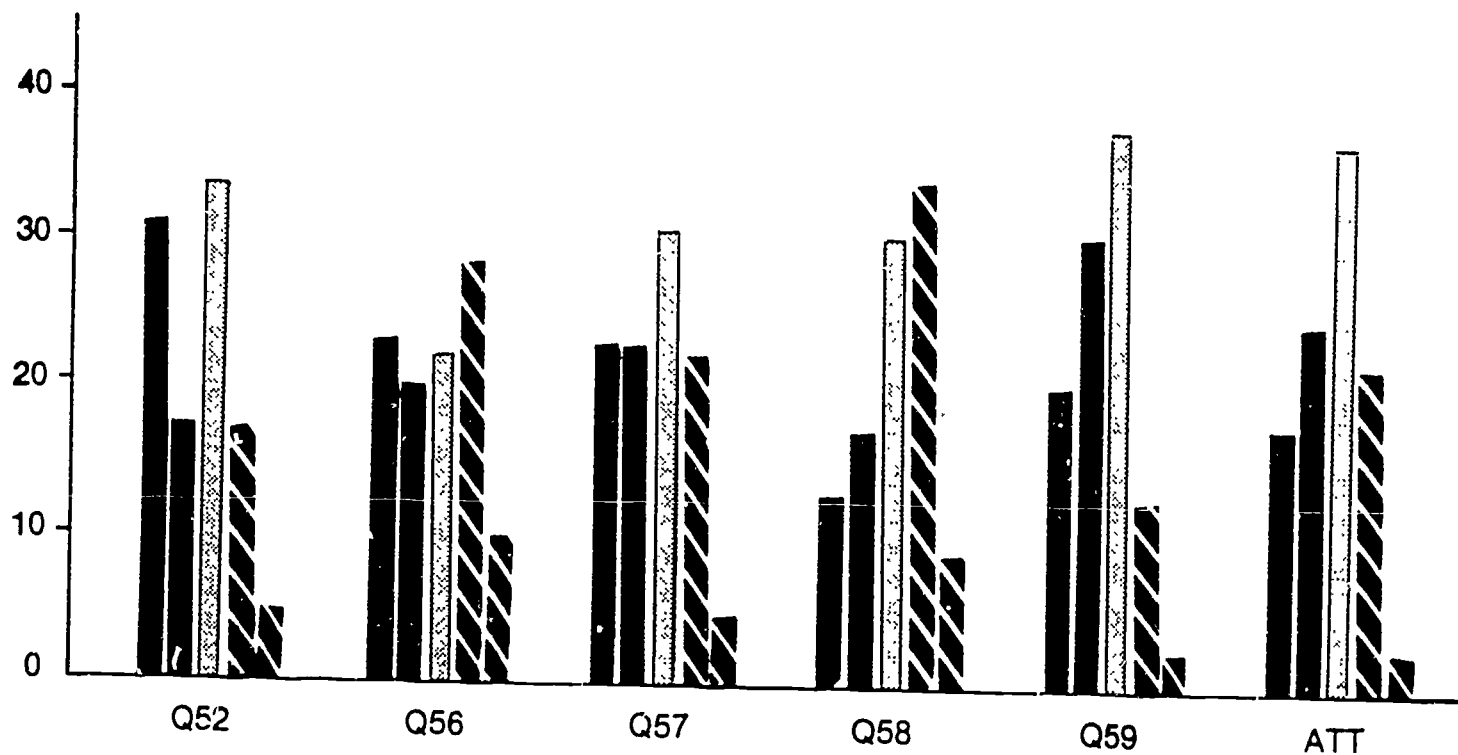


Figure 2: Student response frequencies for six expressions of attitude about MDT multi-digit testing. (N=1440)

each student, ranging from 1 through 5. Correlation coefficients were calculated for the attitude variable with the five variables from which it was derived (see Figure 3). It was decided that the composite dependent variable ATT represented the characteristics of student attitudes toward MDT multi-digit testing better than the other variables singly. The attitude variable ATT was treated as interval data in subsequent analyses.

For the entire sample, the average attitude level is 2.7 on a scale from 1.0 to 5.0. This average is slightly lower than the "neutral" attitude of 3.0.

### Independent Variables

A total of fifty-four independent variables were collected, as listed in Appendix A. The key variables analyzed for this paper deal with personal attributes, college major, academic performance, prior experience with various test formats, attitudes toward those test formats, and attitudes toward the instructor. The analyses of each of these variables were done with tabulations, Pearson's (r) correlation, and ANOVA when appropriate as categorical items.

### Results of Analyses

#### A. Personal attributes:

A.1. Gender (Question 1): In comparison with the mean value of 2.70 for attitude about MDT testing, the means for males (46% of the sample) was 2.58 verses 2.81 for females. Although an apparently small difference of only 0.23 on a five point

ATT	—					
52	.8461	—				
56	.9081	.7165	—			
57	.8617	.6530	.7380	—		
58	.7791	.5214	.6528	.5864	—	
59	.8385	.6789	.7107	.6695	.5358	—
	ATT	52	56	57	58	59

Figure 3: Correlations ( $r$ ) of the Five Variables (Questions 52, 56, 57, 58, 59) that are Combined into the Dependent Variable of Attitude (ATT) [ $p < 0.000$  in all cases]

scale, it was statistically significant when tested with ANOVA. Females are generally believed to have more favorable attitudes about formal education than do males. This holds true in their attitudes toward the MDT technique.

A.2. "Seniority" of Class Status and Age (Question 2 and 3): Age was found to not have a statistically significant correlation with attitude. The same was true for class status. There is no evidence that "seniority," as indicated by age and class status, have any real impact on attitude toward the MDT method.

B. Major (Questions 4 and 5): The hypothesis was that students with longer-term interest in a subject would have greater appreciation of a test method that required them to really learn or know the subject matter. Although this is not supported by the aggregate data being analyzed, some indicated trends might become statistically significant when control variables are used to filter the sample into more homogeneous subgroupings in later analyses.

C. Academic Performance:

C.1. Expected grade (Question 10): The correlation ( $r = 0.320$ ) between expected grade and attitude is significant both in statistical ( $p = 0.000$ ) and practical contexts. Barring the possibility of students stating grossly unrealistic grade expectations, this finding gives encouragement to instructors seeking to serve the top students. The interpretation offered is that the added academic rigor of MDT testing poses desirable challenges for those students.

C.2. Overall Grade Point Average (Question 6): Although statistically significant ( $p = 0.000$ ), the  $r$  correlation value of 0.171 for GPA is not as strong as for the previously discussed expected course grade. This is especially interesting because the correlation between GPA and expected course grade is only 0.477. Therefore, the  $r$ -squared regression value of 0.228 indicates that less than one quarter of the variation in current in-course academic performance, i.e. in expected grade, would be explained by past academic performance as measured by GPA. Academic performances, both current and past, are complex variables influenced by many factors, including examination formats. The relationships between academic performance and student attitudes toward MDT (and all other) forms of testing merit further consideration.

D. Prior Experience/Familiarity with Test Formats (Questions 21 through 41): Students were asked five questions about each of the seven formats of tests: True/False [T/F]; Multiple Choice [MC]; Matching [MAT]; MDT Multi-Digit [MDT]; Fill-in-the-Blank [FIB]; Sentence-long Short Answer [SA]; and Essay [ESS]. Three of the five questions dealt with the student's prior experience and self-perceived ability with those test formats. As expected, students indicating experience and ability with MDT tests also had more favorable attitudes ( $r = 0.253$  and  $r = 0.612$ , respectively, at  $p = 0.000$ ). Those two variables (Questions 31 and 38) only correlate with each other at  $r = 0.259$ , indicating that experience heightens perceived ability, but that experience is not the sole determinant of such ability.

One original hypothesis was that experience and ability with fill-in-the-blank tests would favorably increase the attitudes about MDT testing. The very weak correlation ( $r = 0.073$ ) attained only a  $p = 0.003$  level of statistical significance. A possible explanation is that several of the instructors used short lists of responses, making their exams more like matching tests. The correlation of the ATT attitude variable and ability with taking matching tests was  $r = 0.105$ , at  $p = 0.000$ \_\_.

E. Student Attitudes about Test Formats (Questions 42 through 55): Descriptive statistics for student attitudes about the seven test formats are given in the next section. Concerning their correlations with the ATT attitude variable, the most notable fact is the lack of correlations. The general attitude about true/false tests (Question 49) does correlate negatively and only weakly ( $r = -0.112$ ). The expected correlation with attitudes about fill-in-the-blank tests (Question 53) is only a weak trend ( $p = 0.002$ ). When Question 46 (how well FLB evaluates student learning) is used, the correlation rises to  $r = 0.138$  at  $p = 0.000$ \_\_.

The indications are that the 1440 students in the sample have only a very dim impression that MDT multi-digit testing is similar to fill-in-the-blank testing. This is very likely related to the variations in usage of the MDT technique by the fifteen instructors of those students. [Analyses of the impact of those instructor-related variations upon the student attitudes have not yet been conducted.] Some of that variation is indicated by the correlation ( $r = 0.639$ ) of Question 16: "Are the

MDT testing procedures as used in this course appropriate for the course materials?" This was the highest correlation of any of the independent variables with the ATT attitude variable.

F. Attitude toward instructor (Question 7): The third highest correlate with the ATT attitude dependent variable was how the students rated their instructor. With  $r = 0.349$  and  $p = 0.000$ , the impact of the instructor upon student attitudes toward MDT testing is most noteworthy. Furthermore, since the correlation coefficient for Questions 7 (instructor) and 16 (appropriateness) is only  $r = 0.294$ , those two highest correlates can be used jointly in future analyses to study the instructor-related influences upon attitudes to the MDT and other test formats. Also, by controlling for instructor-related factors, more uniformity of the subsamples can assist in the study of the student-related variables.

#### Comparisons of Seven Test Formats

Interesting "by-products" from the research data are two sets of student perceptions of seven basic test formats. One set (Questions 42 through 48) provides ratings of the formats as to how well each evaluates student learning. The results are shown in Figure 4. The second set (Questions 49 through 55) in Figure 5 shows comparative student attitudes about liking or disliking each test format. No tests of statistical significance of the differences between formats have been made. Rather, the following general observations are offered, with a note that the limited familiarity with the MDT method makes that data the least reliable and most subject to change.

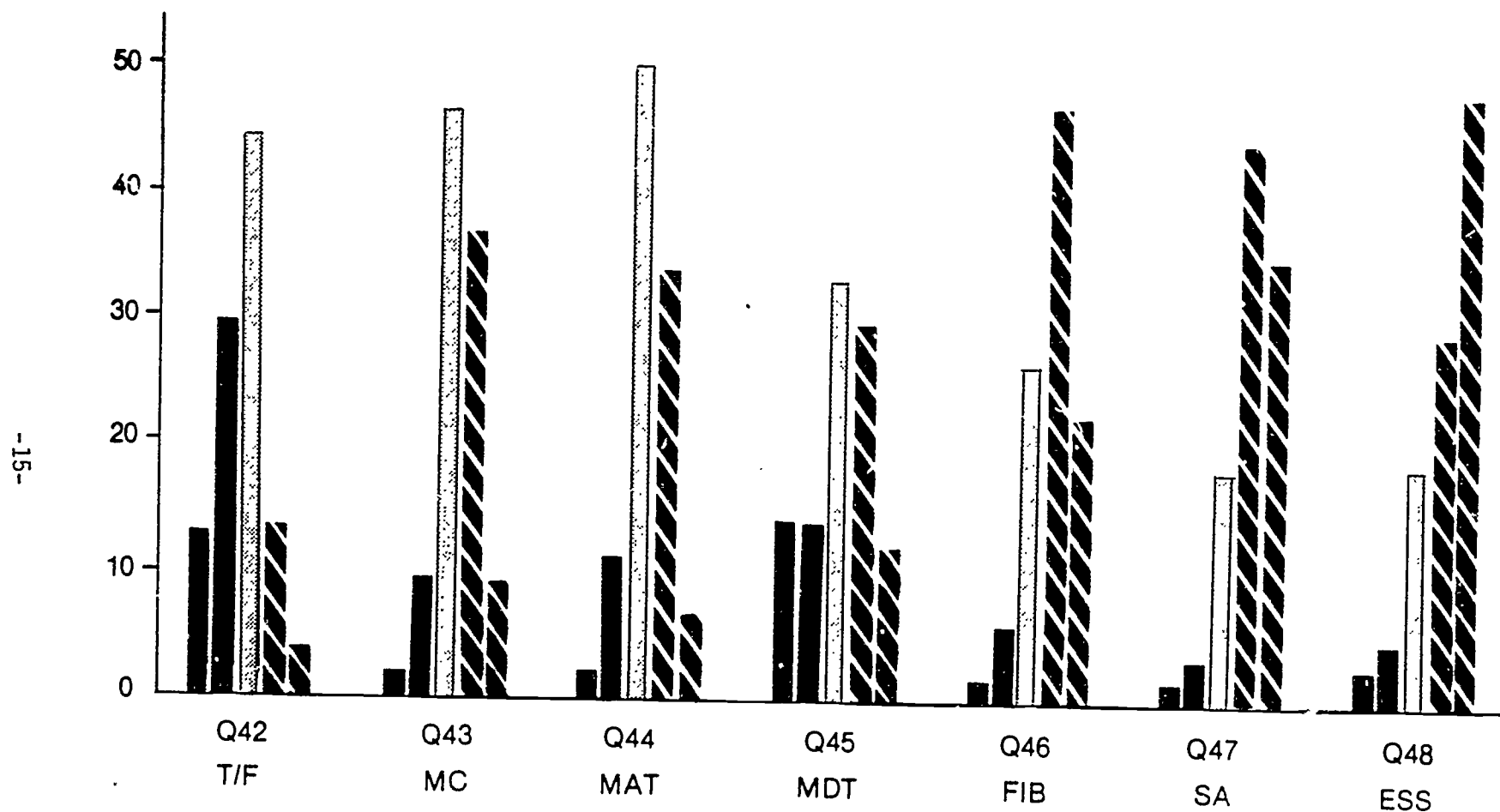


Figure 4: Student opinions of how well each test method evaluates student learning. (N=1440)



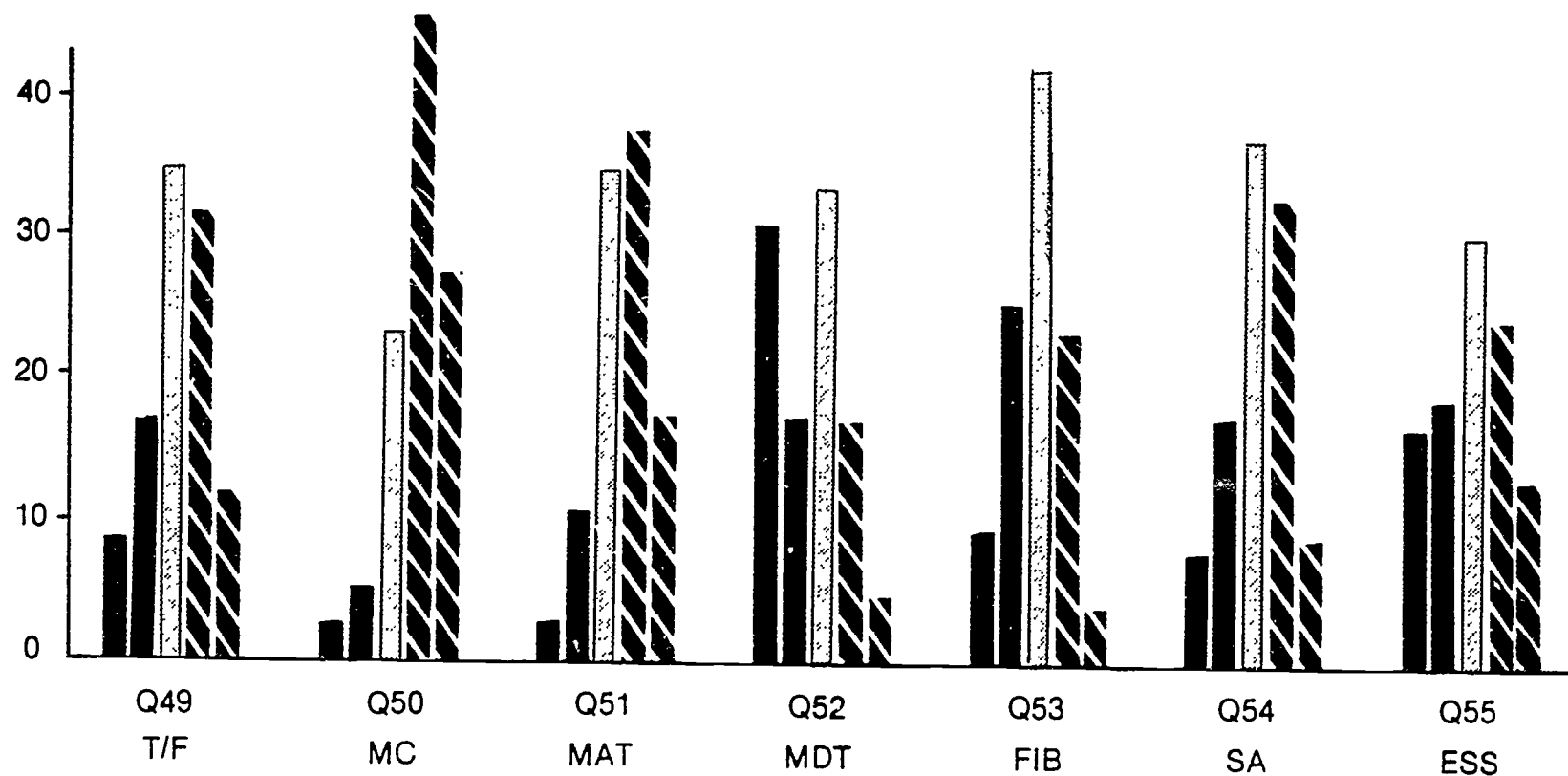


Figure 5: Student attitudes about disliking or liking each of seven test formats. (N=1440)

Observations: According to 1440 fairly typical college students, . . .

- 1) A rank order exists in the ability of test formats to evaluate students, with essay tests being best and true/false being worst.
2. More students chose the highest rating ("evaluates student learning very well") for MDT (11.9%) than for any other machine-scorable format, being MC (8.6%), MAT (6.4%), and T/F (3.4%). When combining the "well" and "very well" levels into a category of "above average," the MDT percentage (39.8%) is very close to that of MC (44.0%) and MAT (39.0%).

NOTE: If, indeed, MDT multi-digit testing is a machine-scorable, near equivalent to fill-in-the-blank questions, it would be reasonable to expect the percentage of students saying "very well" [and "above average"] to rise to nearly the 21.6% [and 66.8%] level of true fill-in-the-blank questions.

3. An almost perfect reversal of the previously discussed rank order exists when attitudes (like/dislike) about test formats are analyzed. The perceived better evaluation formats (Essay, SA and FIB) have greater percentages in the below neutral category.
4. Only MDT has a "strongly dislike" percentage (30.0%) higher than in the "dislike" column (16.9%).

NOTE: It is suspected that the newness of the MDT method was a major influence and that the responses will eventually become more similar to those of FIB. Also, the number already indicating "strongly like" is about equal to that of the FIB group.

In general the data in Figures 4 and 5 indicate that the seven formats are quite distinct in the eyes of students. The continued or increased use of a variety of test methods would appear to be a logical practice in educational measurement in most courses.

### Discussion and Conclusion

The MDT multi-digit technique has opened a new avenue for machine assistance in educational testing and measurement. In the eyes of students it receives a mixed review. Much of the variation in student attitudes seems to be instructor-related. The student-related variables thus far identified with favorable attitudes toward MDT testing are in two major categories. One relates to students' perceived ability and familiarity with the MDT method. This correlation is interpreted to signify that the attitudes will become more favorable as the method becomes increasingly familiar through use in more college classes. Increased ability and subsequently more favorable attitudes will also come as the method is introduced into more academic levels, especially into high schools, training programs and professional courses, as well as in general college classes.

The second major category concerns academic performance, both in a specific course and in general grade point averages.

Essentially, better students (as measured by grades) like it more. The interpretation is that the better students appreciate the increased academic rigor of the MDT method. Increased rigor should yield more favorable attitudes with all serious students, regardless of their grades. However, in reality, some capable students are comfortable and content with mediocre grades that are easily attained. For them, it is desirable to use their ability to correctly make calculated "guesses" through the process of elimination from among five choices. Since recall (rather than recognition) is one of the characteristics of MDT multi-digit testing, the MDT format will not become popular with unmotivated students. On the other hand, for motivated students, teachers, parents, administrators, employers and anyone interested in educational excellence, the MDT method should be favorably received.

#### CITED REFERENCES

Anderson, Paul S. (1987), The MDT Innovation: Machine Scoring of Fill-in-the-Blank Tests. Multi-Digit Technologies (MDT) Corporation, Normal, IL.

# APPENDIX A:

## SURVEY OF STUDENT OPINIONS ABOUT METHODS OF EDUCATIONAL TESTING

Please answer these questions on the new MDT answer sheet (F3). Note that it has Short Answer SA (Essay) spaces at the bottom to make written comments to elaborate on the encoded responses.

**START on QUESTION 21 on back of the answer sheet.**

A. In your high school education, how much experience did you have with each of these test methods?

Question No.	Almost None;	Little;	Some;	Much;	Very Much;
21. True/False	1	2	3	4	5
22. Multiple Choice	1	2	3	4	5
23. Matching	1	2	3	4	5
24. MDT Multi-Digit	1	2	3	4	5
25. Fill-in-the-blank	1	2	3	4	5
26. Short answer (sentence +)	1	2	3	4	5
27. Essay (paragraph +)	1	2	3	4	5

B. In your university education, how much experience have you had with each of these test methods?

Question No.	Almost None;	Little;	Some;	Much;	Very Much;
28. True/False	1	2	3	4	5
29. Multiple Choice	1	2	3	4	5
30. Matching	1	2	3	4	5
31. MDT Multi-Digit	1	2	3	4	5
32. Fill-in-the-blank	1	2	3	4	5
33. Short Answer (sentence +)	1	2	3	4	5
34. Essay (paragraph +)	1	2	3	4	5

C. Rate your ability as a test taker in each of the following methods of testing. (Note: This is NOT a ranking; you could be poor or good at all.)

Question No.	Very Poor;	Poor;	Average;	Good;	Very Good;
35. True/False	1	2	3	4	5
36. Multiple Choice	1	2	3	4	5
37. Matching	1	2	3	4	5
38. MDT Multi-Digit	1	2	3	4	5
39. Fill-in-the-Blank	1	2	3	4	5
40. Short Answer (sentence +)	1	2	3	4	5
41. Essay (paragraph +)	1	2	3	4	5

D. Based upon your test experiences, please rate these test methods according to how well they can evaluate student learning.:

Question No.	Very Poorly;	Poorly;	Average;	Well;	Very Well;
42. True/False	1	2	3	4	5
43. Multiple Choice	1	2	3	4	5
44. Matching	1	2	3	4	5
45. MDT Multi-Digit	1	2	3	4	5
46. Fill-in-the-Blank	1	2	3	4	5
47. Short Answer (sentence +)	1	2	3	4	5
48. Essay (paragraph +)	1	2	3	4	5

E. In general, what is your attitude about each method of testing?

Question No.	Strongly Dislike;	Dislike;	Neutral;	Like;	Strongly Like
49. True/False	1	2	3	4	5
50. Multiple Choice	1	2	3	4	5
51. Matching	1	2	3	4	5
52. MDT Multi-Digit	1	2	3	4	5
53. Fill-in-the-Blank	1	2	3	4	5
54. Short Answer (sentence +)	1	2	3	4	5
55. Essay (paragraph +)	1	2	3	4	5

56. Would you recommend the continued use of the MDT testing method in this course? 1. strongly "no"; 2. basically "no"; 3. neutral; 4. basically "yes"; 5. strongly "yes"
57. Would you recommend the use of the MDT method for any other courses? 1. strongly "no"; 2. basically "no"; 3. neutral; 4. basically "yes"; 5. strongly "yes"
58. Do you consider the MDT method to be a valid or invalid way of testing when applied to the learning of discrete facts? 1. highly invalid; 2. moderately invalid; 3. neutral; 4. moderately valid; 5. highly valid
59. If given the option to enroll in either of two sections of another course, knowing that one would use the MDT method and the other would not, what would be your choice? 1. Definitely avoid the MDT method, even if you had to adversely adjust your schedule of other classes; 2. Try to avoid the MDT method if class schedule permits; 3. Neutral, it makes no difference; 4. Try to enroll in the MDT section if class schedule permits; 5. Definitely enroll in the MDT section even if you had to adversely adjust your schedule of other classes.
60. In comparison with studying for multiple choice and fill-in-the-blank questions, how should a student prepare for MDT Multi-Digit questions on a test? 1. The same as for multiple choice questions; 2. The same as for fill-in-the-blank questions; 3. Just study normally because the three test methods are all so similar; 4. Altogether differently (please comment in the SA space on the answer sheet).

**NOTE:** For research purposes of comparisons and follow-up, mark your name and Social Security Number on the answer sheet. Your data will be confidential.

Please continue with the questions 1-20. These questions are answered on the front (Multi-Digit) side of the answer sheet. You are almost finished.

Question No.

1. What is your sex? 001=male; 002=female.
2. What is your class status? 001=freshman; 002=sophomore; 003=junior; 004= senior; 005=graduate; 006=other.
3. What is your age? (Encode the actual years. For example, if you are 21, encode 021.)
4. What is your major (or probable major)? 001=teacher education/special education; 002=social sciences; 003=fine arts/languages; 004=physical sciences/math; 005=computer/applied technology; 006=business management, accounting, marketing, etc.; 007=truly undecided. Please also write your major (or probable major) in space SA101 at the bottom of the answer sheet.
5. How closely does this course relate to your major and intended future employment? 001=Not at all; 002=very little; 003=some; 004=reasonable amount; 005 very much.
6. What is your overall GPA at ISU? 001=less than 1.75; 002=1.75 to 1.99; 003=2.00 to 2.24; 004=2.25 to 2.49; 005=2.50 to 2.74; 006=2.75 to 2.99; 007=3.00 to 3.24; 008=3.25 to 3.49; 009=3.50 to 3.74; 010=3.75 to 4.00.
7. Overall, how would you rate your instructor in this course? 001=bad; 002=poor; 003=average or okay; 004=good; 005=excellent.
8. Please classify yourself as an ISU student in terms of effort. 001=very low; 002=lower than most; 003=medium; 004=higher than most; 005=very high.
9. Please classify yourself as an ISU student in terms of natural intelligence (ability). 001=very low; 002=lower than most; 003=medium; 004=higher than most; 005=very high.

10. What grade do you expect to receive in this course? 001=F; 002=D/F; 003=D; 004=D/C; 005=C; 006=C/B; 007=B; 008=B/A; 008=B/A; 009=A.
11. What grade do you think you deserve in this course (based on effort and what you have learned during this semester)? 001=F; 002=D/F; 003=D; 004=D/C; 005=C; 006=C/B; 007=B; 008=B/A; 009=A.
12. How much "prior knowledge" of the subject matter did you have before taking this course? 001=none; 002=very little; 003=little; 004=some; 005=much; 006=very much; 007=almost all.
13. Counting this course, how many courses at ISU have you had with tests using the MDT method? Code in the actual number. (For example, three courses would be 003.) Also, please name them in the space . 02 for written comments on the answer sheet.
14. Counting this course, how many of those courses using the MDT method are during this Fall 1986 semester? Code in the actual number. Also, please circle them in SA102.
15. In total for all your courses ever at ISU, how many tests have you taken with MDT style questions?
16. Are the MDT testing procedures as used in this course appropriate for the course material? Mark your answer and then please comment in the SA space on the answer sheet. 001=very inappropriate; 002=inappropriate; 003=appropriate; 004=highly appropriate.
17. Are the other testing procedures as used in this course appropriate to the course material? (Please comment and/or suggest alternatives.) 001=very inappropriate; 002=inappropriate; 003=appropriate; 004=highly appropriate.
18. Are you being graded fairly in this class? 001=very fairly; 002=unfairly; 003=average/fairly; 004=very fairly.

Please comment in the SA spaces on the answer sheet. We read your comments.

Please be sure that you have answered all of the questions. Incomplete data is unnecessarily difficult to analyze. Thank you for your cooperation.